ANNUAL REPORT FY08

Furbearer Program
Resource Science Division
Missouri Department of Conservation

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INTRODUCTION

Missouri's wild fur market has been monitored annually since 1940, although some data date back to 1934. We use mandatory fur buyer and dealer transaction records, interviews with fur buyers and dealers, (mandatory pelt registration for bobcats and river otters since 1980 and 1996, respectively), and fur auctions to monitor annual harvests. Since 1934, we have witnessed tremendous fluctuations in the harvests of Missouri's primary furbearing animals as both market trends and social trends change. The number of fur trader permits issued by the Missouri Department of Conservation peaked at 1,192 during the 1945-46 season; during 2007-08 we sold 41 permits. The number of Resident Trapping Permits sold peaked at 13,248 in 1980-81 (permits were first required in 1953), and reached a low of 2,050 in 2000; during 2007-08 we sold 5,126 permits (Table 1). Estimates of raccoon hunters (via Small Game Harvest Mail Survey) peaked in the 1979-80 season at 48,000 participants. Since this time numbers have declined and appear to have leveled at around 12,000 hunters annually. Total pelts harvested reached 834,935 in 1940-41 (over 70% were opossum and skunk pelts), and again reached the second highest peak in 1979 at 634,338 when raccoon pelt values were estimated at $27.50 average (Table 2). The overall value of the furbearer harvest also peaked in 1979-80 at over $9 million. Pelt values declined dramatically during the late 1980s and through the mid 1990s, and the number of participants fell to all-time lows.

In 2007-08, the raccoon harvest remained above 100,000 (Table 3) and was the second highest over the past 10 years. Bobcat harvest dropped but still remained above 3,000. Otters were down as well with a harvest of 1,421 compared to over 3,000 in 2005-06. The raccoon market shows some promise for 2008, but overall we may be witnessing another lengthy period of relatively low pelt values for many of the commonly hunted and trapped species. Also contained in this report are updates and progress summaries for various furbearer-related research projects, monitoring efforts, or items of interest. These are only for informational purposes and should be considered draft reports.

In addition to harvest information, wildlife population trends are monitored using archer's indices and sign station surveys. Archer's indices are based on wildlife observation reports sent in voluntarily by bowhunters. Sign station surveys occur in 25 counties. Each county route consists of 50 stations, a station being a 3-foot-diameter circle of sifted soil with a fatty acid attractant in the center. Animals that are attracted to the scent leave tracks within the circle. Conservation Department staff run the routes in early autumn.

SECTION 1:
Furbearer Status

MISSOURI FURBEARER HARVEST 2007- 2008

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Liz Forbes, Resource Assistant, Missouri Department of Conservation

HARVEST COMPARISONS

Fur dealer/handlers purchase a commercial permit, issued by MDC, for the buying and selling of fur in the state. They are required to maintain records of all fur transactions in Missouri. The data from these fur reports ("fur books") is entered into a database to help estimate furbearer harvest trends.

Table 1. Furbearer harvest and pelt prices in Missouri over the last three years.

Species	FUR SEASON					
	2007-08*		2006-07		2005-06	
	Number of pelts sold or registered	Pelt Prices (avg. from auctions)	Number of pelts sold or registered	Pelt Prices	Number of pelts sold or registered	Pelt Prices
Raccoon	118,166	$17.95	122,155	$11.90	84,654	$8.23
Opossum	11,135	$1.91	11,195	$1.65	8,829	$1.56
Muskrat	8,125	$3.29	16,213	$5.72	16,221	$4.39
Coyote	3,449	$13.34	3,913	$17.84	3,440	$12.04
Beaver	6,107	$15.17	8,786	$18.10	10,286	$13.70
Mink	1,072	$10.59 (m) $6.75 (f)	1,518	$15.84	1,490	$16.12
Red Fox	1,236	$15.46	1,331	$18.88	1,103	$15.54
Gray Fox	1,205	$34.88	939	$32.86	736	$16.23
Str. Skunk	616	$3.61	715	$5.47	381	$2.96
Badger	47	$13.17	81	$26.00	76	$15.23
Bobcat	3,706	$56.93	4,453	$59.78	4,061	$44.53
River Otter	1,421	$32.00	1,929	$42.77	3,281	$124.92
Trapping permits sold	5,126		4,600		4,224	

Data (except bobcat and otter) comes from the number of pelts that were purchased by fur dealers/buyers and number of pelts reported as held by fur handlers. Bobcat and otter data comes from mandatory pelt registration records.
*2007-08 data current as of 9/22/08. Fur books turned in by 32/36 of in-state and 5/5 of out-of-state fur dealer permit holders.

Fairly strong demand for large raccoons and bobcats propelled last year's fur market. Most fur buyers believe the market will hold for these species and should increase trapping interest and permit sales. Beaver prices were strong late last year and otter interest appears to be flat with black otters selling for $30-40 and brown otters at <$20.

AUCTION PRICES

Fur auctions are held by the Missouri Trappers Association three times yearly at the Boone County Fairgrounds. Prices are averaged from all fur sold, including green, finished and damaged (Table 2).

Table 2. Range of furbearer pelt prices in Missouri during the 2007-08 trapping season.

	2008			
Species	**January 5**	**January 19**	**February 13**	Average
Muskrat	$3.41	$3.41	$3.04	$3.29
Raccoon	$16.25	$21.50	$16.11	$17.95
Male Mink	$11.75	$11.38	$8.63	$10.59
Female Mink	xx	$8.82	$4.67	$6.75
Opossum	$0.50	$2.47	$2.75	$1.91
Beaver	$14.87	$16.48	$14.15	$15.17
Red Fox	$17.00	$15.19	$14.19	$15.46
Gray Fox	$33.00	$36.53	$35.11	$34.88
Coyote	$14.82	$13.63	$11.56	$13.34
Bobcat	$58.33	$59.49	$52.96	$56.93
Deer Hide	$4.17	$5.90	$3.49	$4.52
Otter	$33.45	$31.59	$30.95	$32.00
Squirrel Tail	xx	$0.18	$0.14	$0.16
Squirrel Hide	xx	$1.03	$0.72	$0.88
Skunk	xx	$3.73	$3.49	$3.61
Badger	xx	$17.00	$9.33	$13.17
Beaver Castor	xx	$10.67	$19.25	$14.96
Other	xx	xx	$1.15	$1.15

Source: Missouri Fur Trappers Association web page, accessed 3-18-08, for Boone County Fairgrounds.

FURBEARER POPULATION AND HARVEST TRENDS

Raccoon Status

Raccoon fur harvest during the 2007-08 season (118,166) was down 3.2 percent from the 2006-07 season (122,155). However, the past season's harvest was 39.5 percent higher compared to the 2005-06 season of 84,654. The table below shows the raccoon harvest over the last 10 years.

Table 3. Raccoon harvest in Missouri during the last 10 years.

Season	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Number harvested	107,267	55,347	50,254	110,603	103,550	102,448	116,396	84,654	122,155	118,166

Source: Fur reports data (fur buyers/dealers) and fur handler data. 2007-08 data current as of 9/22/08. Fur books were turned in by 32/36 of in-state and 5/5 of out-of-state fur dealer permit holders.

Raccoon observations from archers during 2007 suggest a decline from 2006 levels (Figure 1), however the overall trend in sightings appears to be steady with a slight increase over the last decade. The observation period during archery season was shortened last year because of the early firearms deer season opening date.

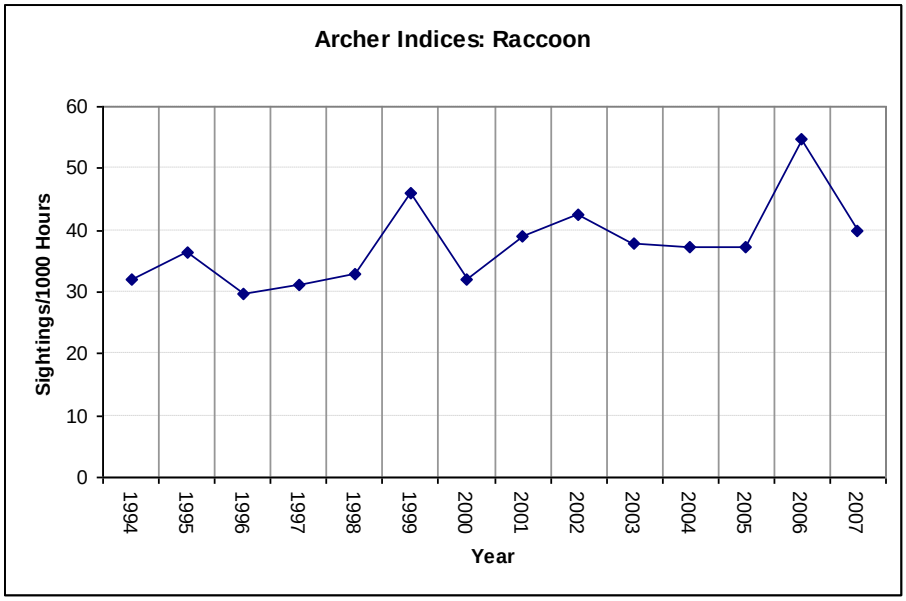

Figure 1. Raccoon population trends based on observations of bowhunters.

The presence of raccoon tracks at furbearer sign stations reached its highest number in 2007 (Figure 2). The number of raccoon visits per 1,000 operable stations has tripled in the last 30 years as this adaptable generalist continues to thrive.

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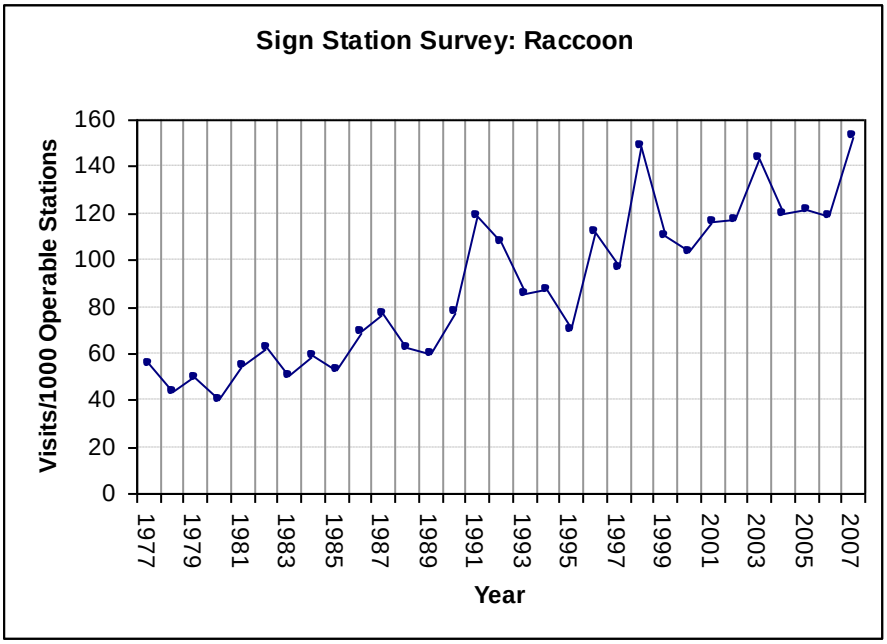


Figure 2. Raccoon population trends based on sign station surveys.

Coyote Status

Coyote fur harvest during the 2007-08 season (3,449) was down 11.9 percent (Table 4) from the 2006-07 season (3,913). It was nearly the same when compared to the 2005-06 season (3,440). Coyote pelt values are too low to attract most trappers but many trappers are using cable restraints to capture coyotes for the live market associated with hound running pens. Trend data for coyotes suggest (Figure 3, Figure 4) populations are stable but higher than those observed during the mid 1970's.

Table 4. Coyote harvest in Missouri during the last 10 years.

Season	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Number harvested	410	518	1,035	957	2,627	3,326	3,325	3,440	3,913	3,449

Source: Fur reports data (fur buyers/dealers) and fur handler data. 2007-08 data current as of 9/22/08. Fur books turned in by 32/36 of in-state and 5/5 of out-of-state fur dealer permit holders.

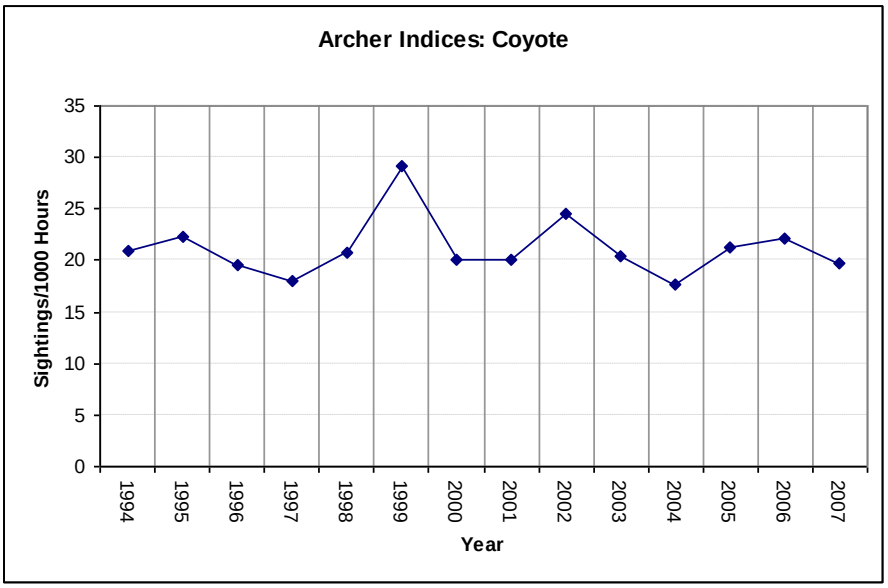


Figure 3. Coyote population trends based on observations of bowhunters.

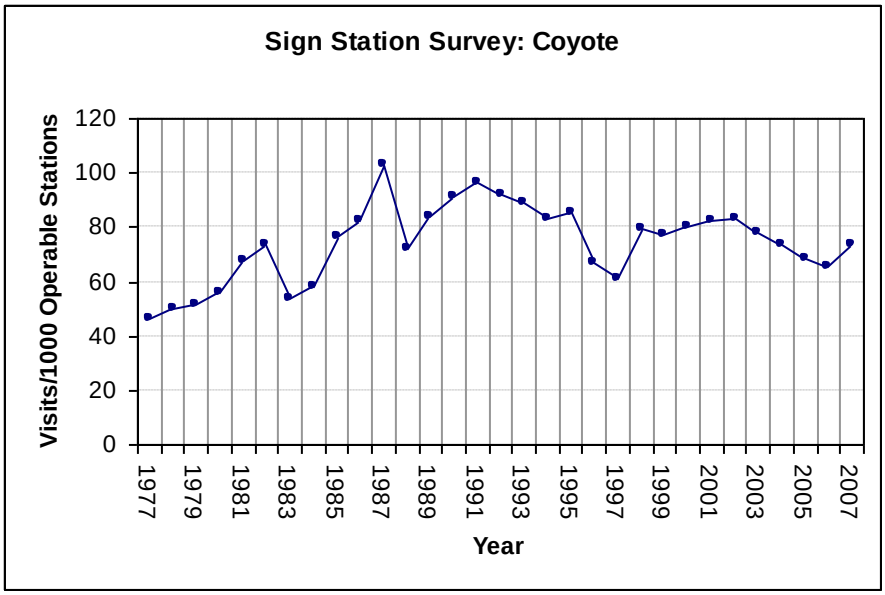


Figure 4. Coyote population trends based on sign station surveys.

Fox Status

Red fox harvest (1,236) was down 7.1 percent (Table 5) compared to the 2006-07 season of 1,331 but was 12.1 percent higher than the 2005-06 season (1,103). Both the archer observations and sign station surveys reflect an observed dip in the red fox population. Gray fox harvest (1,205) was higher than the last two seasons. It was up 28.3 percent from last season's total of 939. It was up 63.7 percent from the 2005-06 season total of 736. The archer observations also reflect a slight rise in the gray fox population over the last few years (Figure 5). Sign station surveys show fewer gray fox visits than last year, but still higher than the last few years (Figure 6).

Table 5. Red and gray fox harvest in Missouri during the last 10 years.

Season	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Red Fox	534	497	515	818	1,434	1,173	1,118	1,103	1,331	1,236
Gray Fox	658	413	469	741	776	879	1,023	736	939	1,205

Source: Fur reports data (fur buyers/dealers) and fur handler data. 2007-08 data current as of 9/22/08. Fur books turned in by 32/36 of in-state and 5/5 of out-of-state fur dealer permit holders.

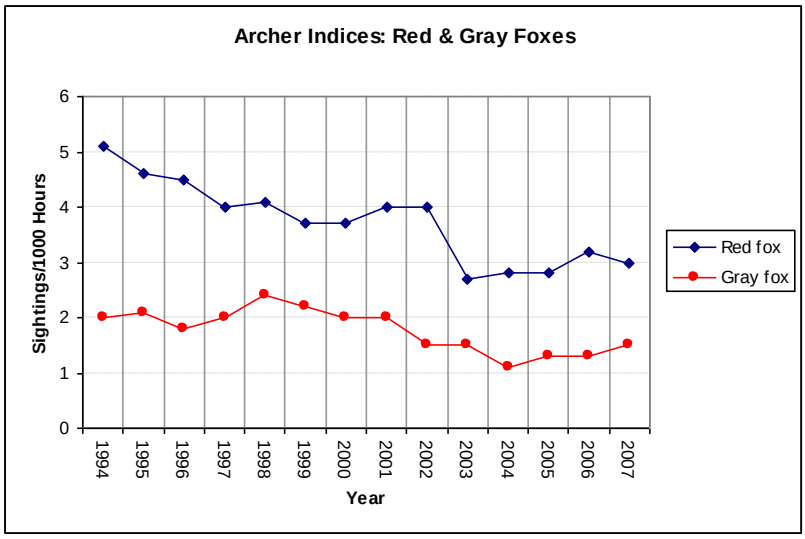


Figure 5. Fox population trends based on observations of bowhunters.

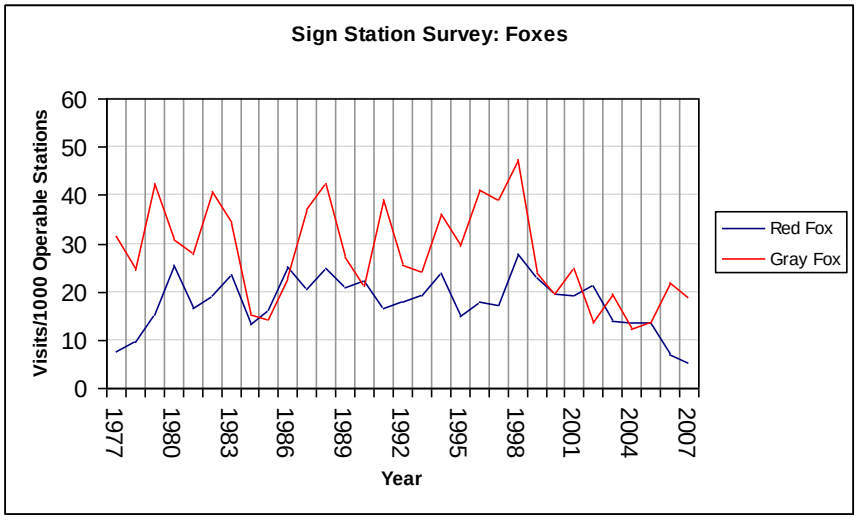


Figure 6. Fox population trends based on sign station surveys.

Bobcat Status

Trappers and hunters are required to check and seal bobcat carcasses or green pelts at MDC offices or with Conservation Agents. The data collected is used to monitor bobcat harvest in Missouri. Based on bobcat check sheets (Figure 7), the 2007-08 statewide harvest of bobcats was 3,706. This figure is 16.7 percent lower than the last season (4,453) and 8.7 percent lower than the 2005-06 season (4,061). However, the recent season's harvest was nearly the same as the 2004-05 season (3,701). Bobcat harvest distribution suggests most trapping pressure occurs earlier in the season (Table 7) although pelts are most prime after December.

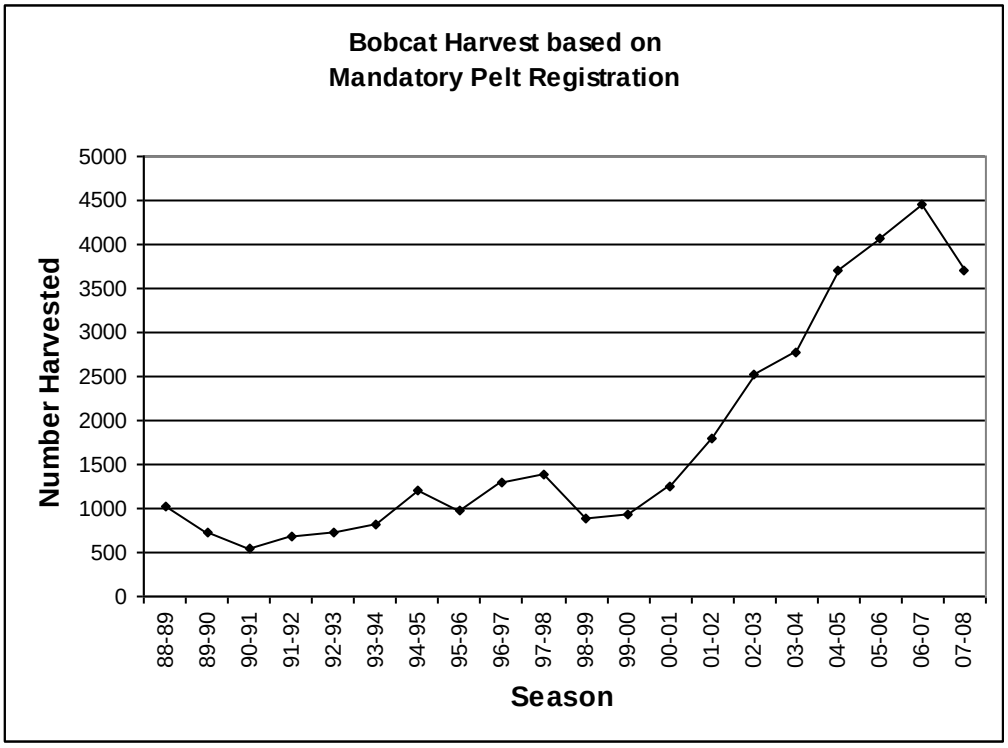


Figure 7. Bobcat harvest trends based on report data from mandatory checksheets.

Data are also collected from fur dealers/buyers. The number of bobcat pelts traded in 2007-08 was 2,141 (Figure 8), which was down 51.9 percent from 2006-07 (4,453). Compared to the 2005-06 season (4,061), the number of pelts sold was down 47.3 percent while pelt prices were up slightly at around $60 (Figure 9). Many trappers are selling bobcats to taxidermists or having them mounted and selling them through the internet. I suspect the significant drop in pelt sales is a reflection of this trend. Our data suggests bobcat populations may have dipped some over the last couple years – perhaps from high trapping pressure, but the overall trend is still stable to increasing (Figure 10, Figure 11). Regional harvest (Figure 12) of bobcats has dropped in most of north Missouri, this may be the result of higher trapping pressure and/or related to decreased CRP enrollment as a result of high grain prices.

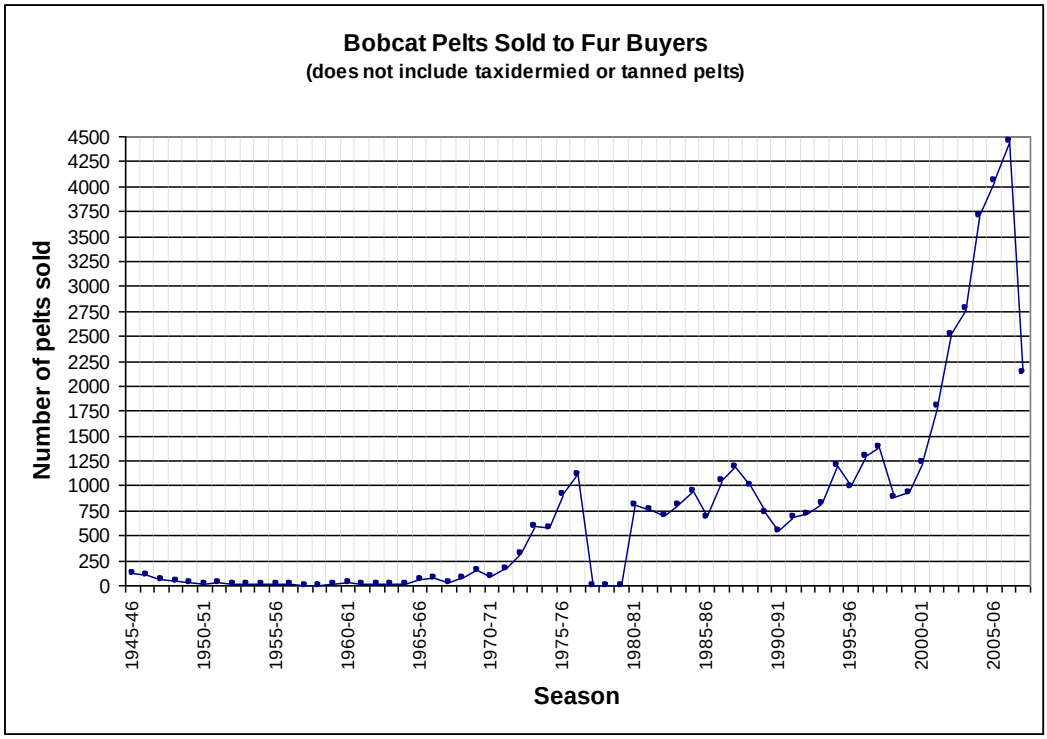


Figure 8. Bobcat pelt sales trend based on fur dealer information of pelts bought.

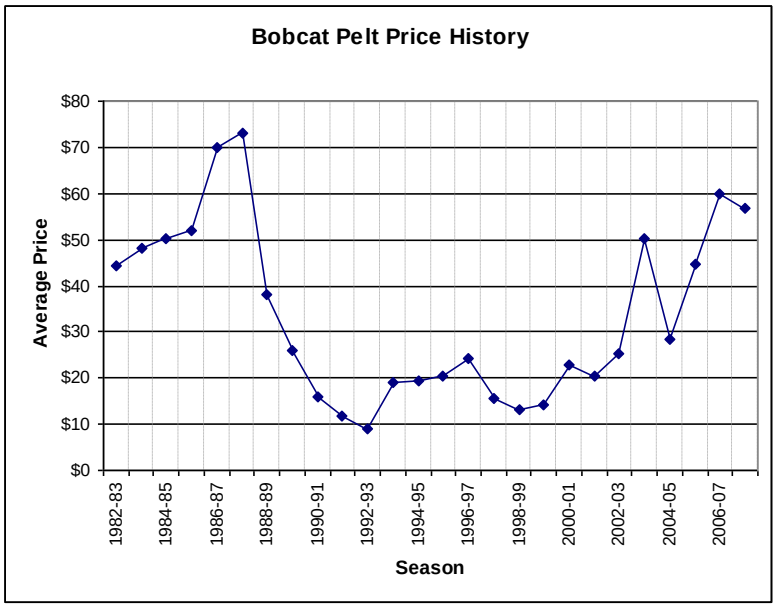


Figure 9. Bobcat pelt price fluctuations over time.

Table 5. A 10-year look at bobcat harvest* and pelt prices in Missouri by Zoogeographic Regions.

ZooRegion	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08
Bobcat Pelt Prices	$13.15	$14.20	$22.87	$20.40	$25.38	$50.15	$28.50	$44.53	$59.78	$56.93
Northwest Prairie	--	62	84	194	470	347	410	470	493	358
Northern Riverbreaks	--	58	96	166	294	387	552	604	636	373
Northeast Riverbreaks	10	41	44	92	126	150	446	558	678	521
Western Prairie	209	171	288	355	497	605	624	616	763	572
Western Ozark Border	101	99	154	212	298	297	364	473	431	377
Ozark Plateau	391	296	349	492	487	648	881	852	918	984
North and East Ozark Border	114	147	120	178	205	233	291	289	372	316
Mississippi Lowlands	66	57	99	98	113	116	133	208	158	159
Unknown	0	0	9	7	0	0	0	1	4	46
TOTAL	891	931	1243	1794	2513	2783	3701	4061	4453	3706

*Source: Bobcat check sheets turned in by MDC offices and Conservation Agents

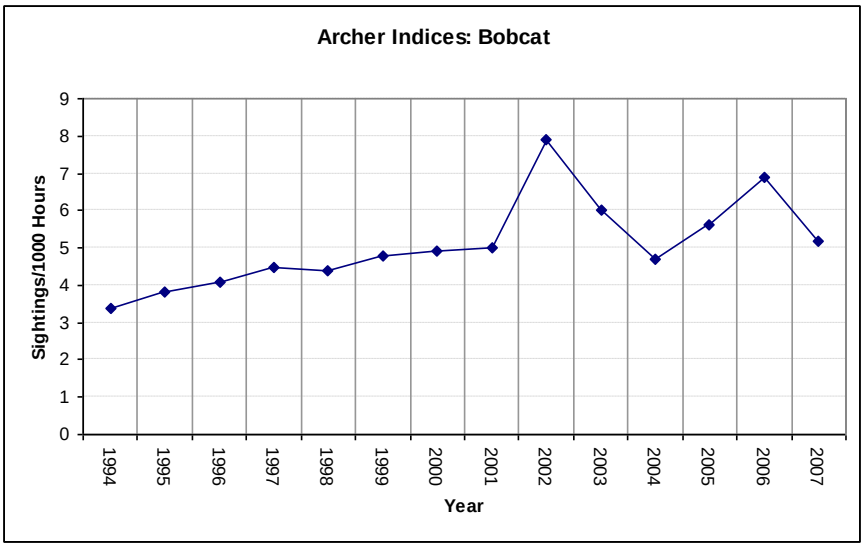


Figure 10. Bobcat population trends based on observations of bowhunters.

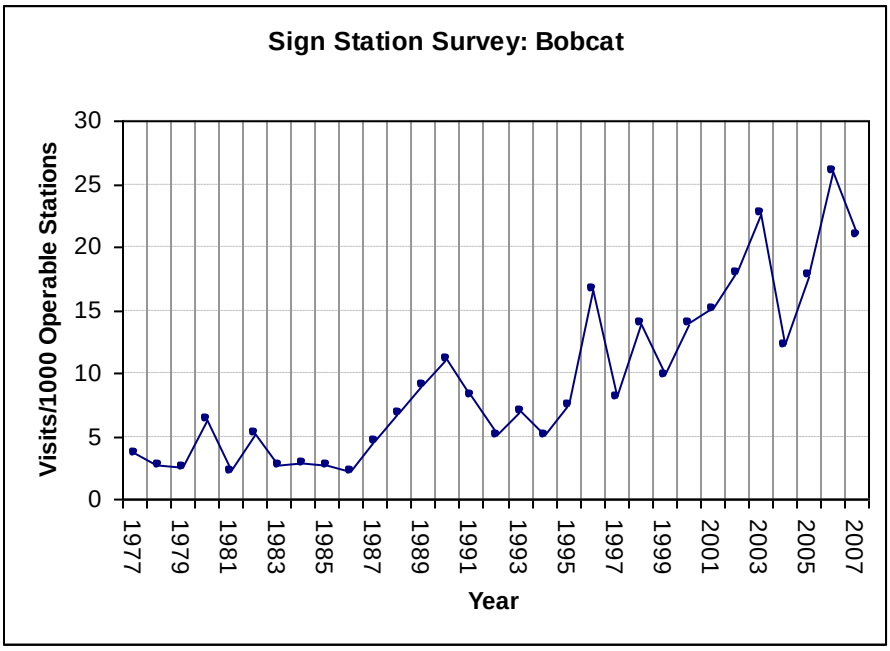
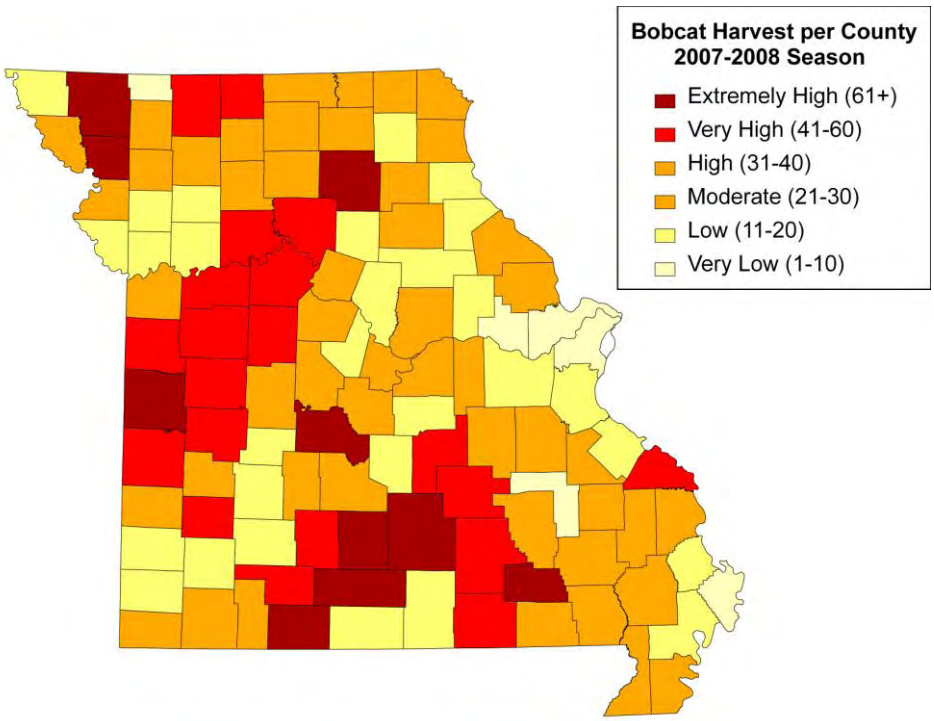


Figure 11. Bobcat population trends based on sign station surveys.



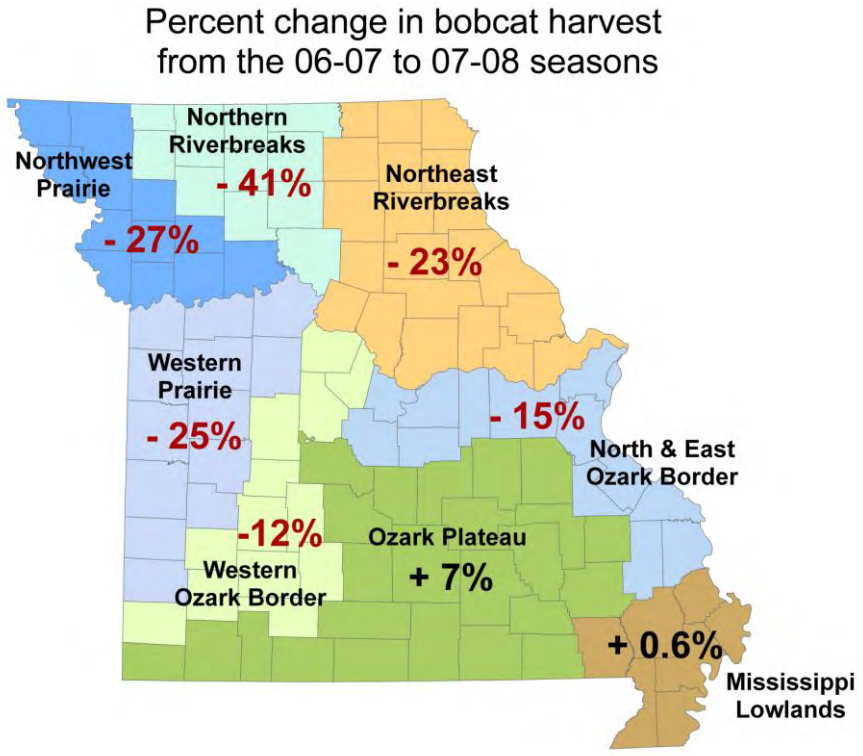


Figure 12. Maps showing comparison of bobcat harvest between counties and harvest seasons.

Otter Status

Trappers and hunters are required to check and seal river otter carcasses or green hides at MDC offices or with Conservation Agents. The data collected are used to monitor statewide and regional otter harvest in Missouri. Based on otter check sheets the 2007-08 statewide harvest was 1,421 (Table 6), 26 percent lower than last year and 56 percent lower than the 2005-06 season (Figure 14). Otter pelt prices, and not abundance, likely influenced the harvest rates (Figure 15, Figure 16). Most river otter harvest occurs in Zones B and E (Figure 13, Figure 17, Figure 18). High otter pelt prices have resulted in lower otter densities on some Ozark streams and this likely has eased pressure by local fisherman and their disdain for otters. Recent low pelt prices may allow otter populations to rebound and we should expect more complaints by fishermen and pond owners. We are currently considering trapping regulation changes to liberalize otter harvest with a goal of maintaining otter densities that are compatible with Ozark fisheries. Although most otter harvest occurs during December and January (Table 7), a longer season would enable targeted harvests. We are currently studying metabolic rates and census techniques to gain a better understanding of how otters may impact fish populations in Ozark streams.

Table 6. Missouri River Otter Harvest by Trapping Zone, based on mandatory pelt registration.

	Harvest Season					
Zone	**2002-2003**	**2003-2004**	**2004-2005***	**2005-2006**	**2006-2007**	**2007-08**
A	100	77	93	105	55	36
B	1213	1450	1622	1862	1060	794
C	20	41	40	41	56	36
D	31	14	5	9	23	7
E	893	1174	1214	1252	731	477
Unknown	0	2	7	5	4	71
Total	2257	2758	2981	3274	1929	1421

* 2004- 2005 season dates changed to Nov 15- Feb 15 for zones A-D, and Feb 20 for Zone E; Approximately 480 otters (16%) were taken during the extended trapping period in Zones A-D.

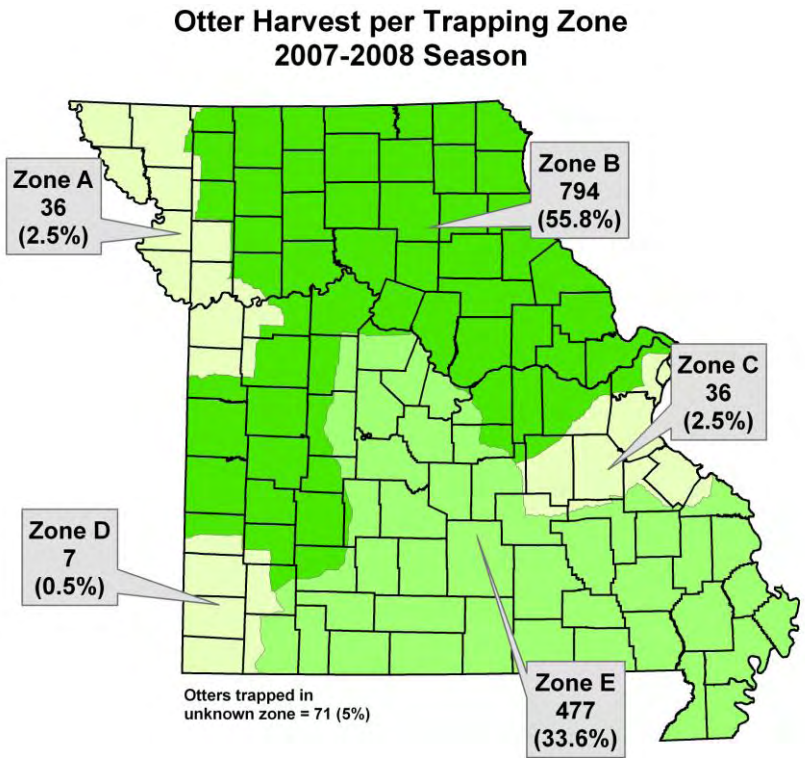


Figure 13. Percent of otters harvested in each of the five trapping zones.

The graph below tracks otter harvest history since the season was re-opened in 1996. Otter pelt prices reached their highest during the 2005-06 season. The high number of harvested otters reflects this.

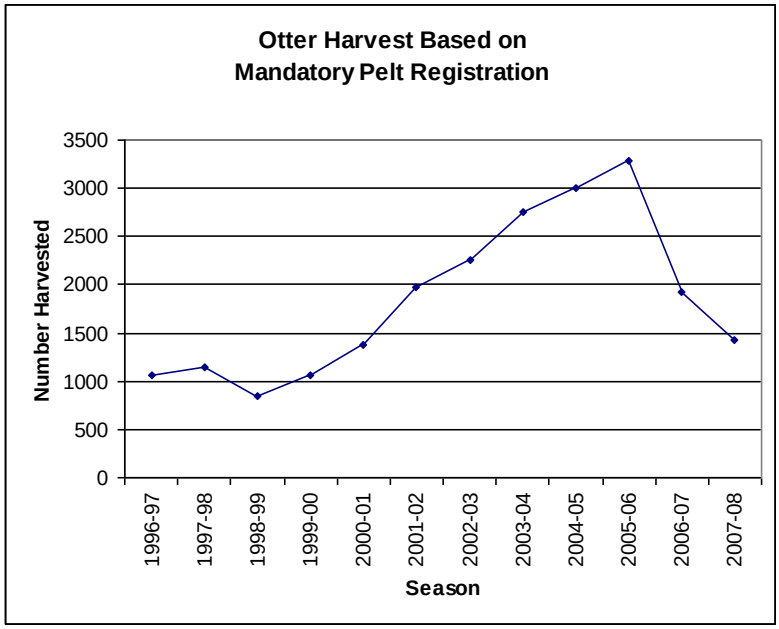


Figure 14. Otter harvest trends based on harvest data from mandatory checksheets.

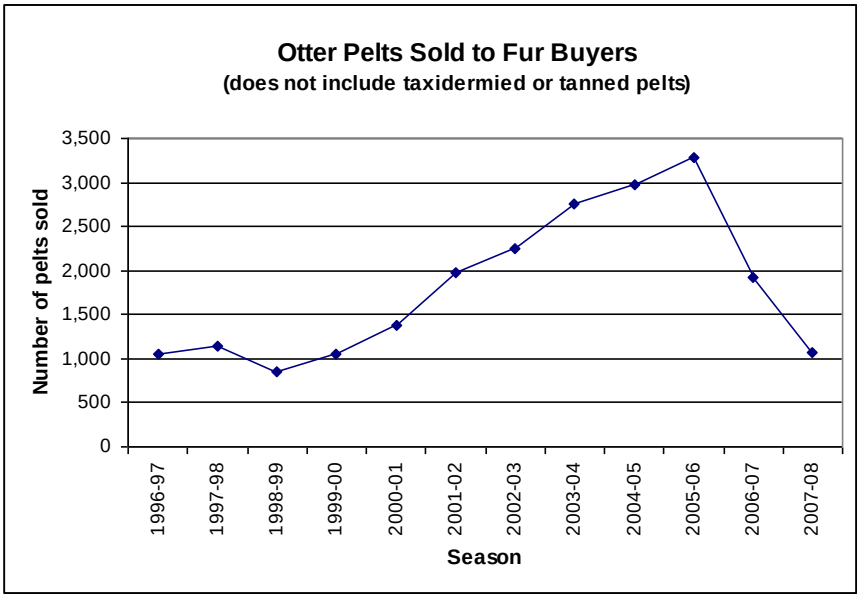


Figure 15. Otter harvest trends based on fur dealer information of pelts bought.

Figure 16. Otter pelt price fluctuations over time.

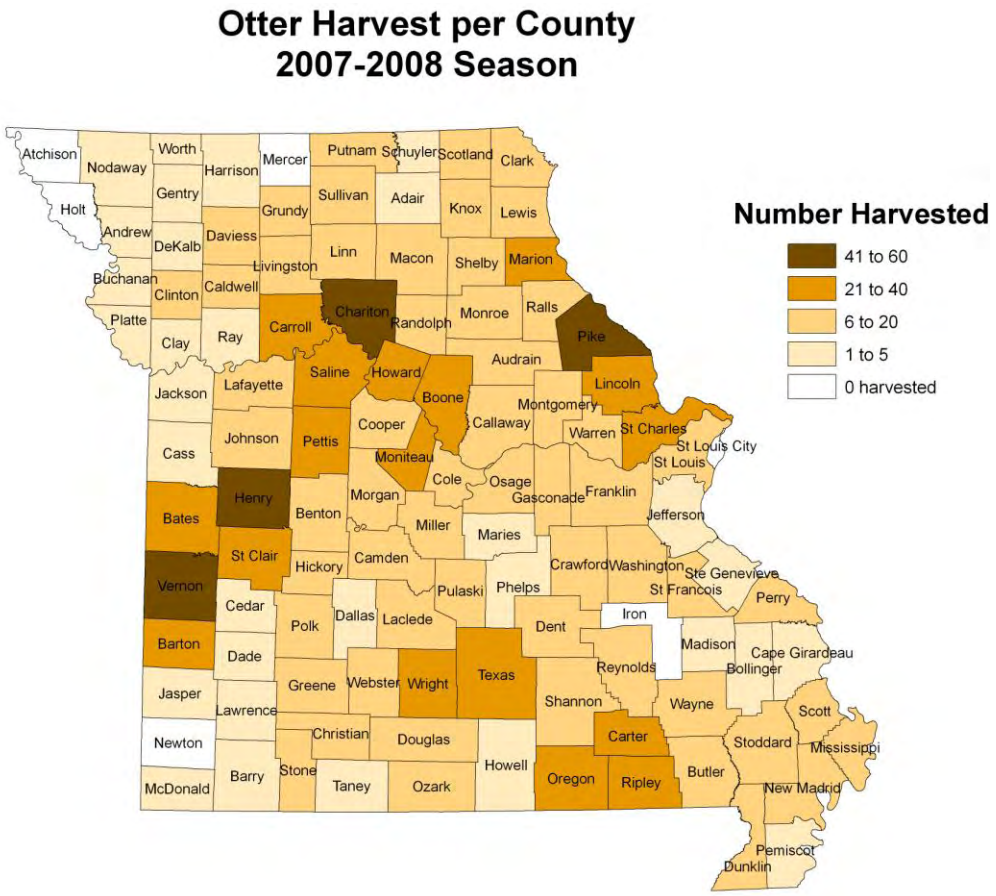


Figure 17. The number of otters harvested by county.

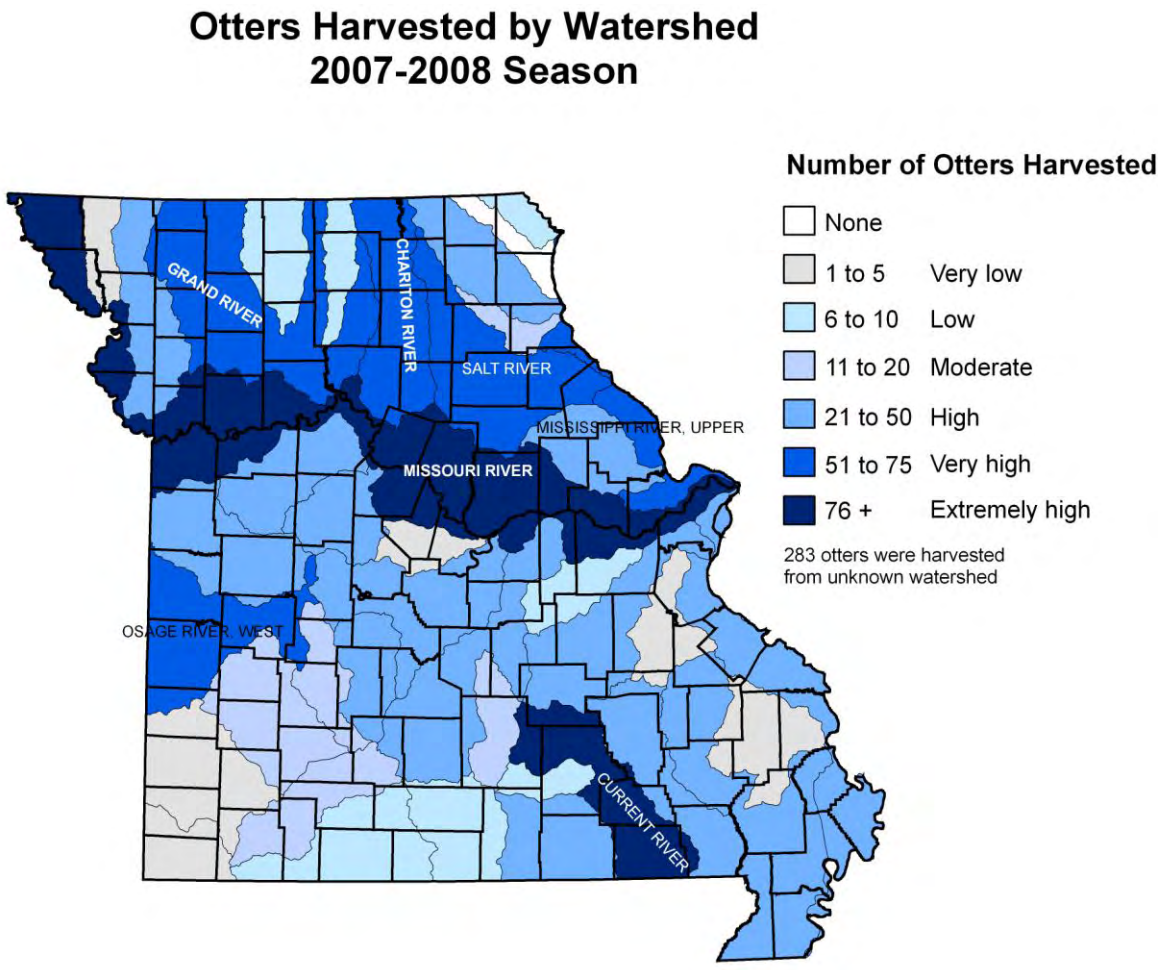


Figure 18. Otter harvest distribution among watersheds.

Otter harvest during the 2007-08 season was highest (76 or more harvested) in the Missouri and Current river watersheds. Other watersheds with very high harvest were the Grand, Chariton, Salt, Upper Mississippi and Osage River watersheds.

WEEKLY HARVEST DISTRIBUTION: BOBCAT AND OTTER

Table 7. Otter and bobcat harvest during each week of the 2007-08 season

Week of the Furbearer Season	Number of Otters Harvested*	Number of Bobcats Harvested**
1 (Nov.15-20)	93	392
2 (Nov. 21-27)	149	267
3 (Nov. 28- Dec. 4)	166	341
4 (Dec. 5-11)	127	277
5 (Dec. 12-18)	127	329
6 (Dec. 19-25)	148	341
7 (Dec. 26-Jan. 1)	132	406
8 (Jan. 2-8)	145	418
9 (Jan.9-15)	110	308
10 (Jan. 16-22)	86	257
11 (Jan. 23-29)	52	210
12 (Jan. 30- Feb. 5)	35	54
13 (Feb 6-12)	20	4
14 (Feb. 13-20)	10	1
Unknown date	15	58
Totals	**1415**	**3663**
Adjusted Total	**1421***	**3706****

* Additional take: 5 otters on Nov. 7-14 and 1 otter was taken on Feb. 25.

** Additional take: 7 bobcats were taken Nov. 2-14; 5 were taken on unknown date in Nov.; 7 from unknown date in Dec.; 1 bobcat was taken on Feb. 24.; 24 were taken on unknown date in Jan.; 3 were taken in October; minus 4 bobcats that were confirmed retags.

SECTION 2:
Research Projects and Other Issues

OTTER POPULATION DYNAMICS STUDY UPDATE

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Steve May, Resource Assistant, Missouri Department of Conservation

NORTH STUDY SITE

The *North Missouri River Otter Population Study* took place in the northern Missouri counties of Linn, Livingston and Chariton. Trapping began in fall 2000 and continued through spring 2007. Public lands used for trapping included Swan Lake National Wildlife Refuge, Pershing State Park and Fountain Grove Conservation Area. Eight to 24 animals were captured per season by foothold or cage traps.

During the project, 161 individual otters (61 females, 75 males and 25 unknown sex) were successfully captured, implanted with radio transmitters and released. They were tracked from fall 2000 to spring 2008. So far, approximately 3,850 point locations have been digitized with ArcGIS. The number of point locations per individual range from 1 to 135, averaging 23.9 point locations per individual.

A total of 144 radio transmitters were used during this project. Some transmitters were recycled following mortalities due to trapping or other causes. Some otters received more than one frequency if recaptured and initial transmitter was faulty or battery was weak.

Some trends that were initially identified show that the otters stay mainly within waterways and wetland areas. Some individuals were very site-specific, not straying very far from a particular area. Other individuals seem very nomadic and moved greater distances. Many otters stayed within a particular waterway.

Statistics on mortality, trapping rates and other information have not yet been compiled.

SOUTH STUDY SITE

Entry of telemetry data from the south study site (Texas county; Big Piney, Niangua, Roubidoux, West Piney rivers) has begun. Points will be mapped using ArcGIS. Otters from this site were tracked from 2002 through fall 2007.

OTTER DNA POPULATION ESTIMATE

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Chuelo Arias, Resource Assistant, Missouri Department of Conservation

Assessing the potential use of DNA extracted from river otter latrine deposits to verify otter scat counts as an index to otter populations

Earlier, a proposal was submitted by Dave Hamilton to extract DNA from fresh otter scat to use the unique DNA profile to estimate minimum otter numbers on selected stream segments. In addition these DNA data could be used in a capture-recapture methodology to give better estimates of populations of otters on stream segments. Results of this project could help to measure otter densities and perhaps their impacts to smallmouth populations on head water Ozark streams. Before moving forward with this idea, we spent this past year attempting to verify whether the concept was actually feasible. We collected scat and tissue samples from trapper-caught otters and submitted these samples for DNA analysis.

The pilot project had five main goals:

1. **Isolate usable DNA from tissue and scat**
   Jeff Koppleman's lab was able to isolate DNA from most scat and tissue (Figure 1). Percent isolation success is potentially higher than the graph shows, as some samples that did not show bands in the genomic DNA check gel may amplify successfully.

   Two different QIAGEN kits were required for extraction, each with a maximum processing capacity of 24 samples per run. The tissue kit took approximately 2 hours to complete, while the stool kit took 4-5 hours each time. The stool kit had additional steps to remove PCR-inhibitors and increase DNA yield from weak samples. DNA was extracted from both the fecal matter and the gelatinous matrix in scat samples, taking care to avoid fish scales and bones.

   Samples were stored in the laboratory refridgerator until all eight scat samples per individual were received, and then they were isolated as one batch. It was not possible to isolate each sample the day that it was done 'weathering', since multiple samples per individual were often received on the same day, and some samples were received late in the day or on Friday afternoons. Any leftover scat material was repackaged in a screw-top mini tube and preserved in ethanol.

2. **Compare quality of DNA from scat 'weathered' multiple days**
   We were able to isolate DNA from scat samples that had been left outside for the full seven day weathering period. Genomic DNA quality (when compared by visualizing on a gel) appeared to be more dependent on the individual sample than the number of weathering days, such that if an individual showed high quality at the beginning, it usually had high quality DNA at the end, versus all samples starting off high quality and deteriorating after four days of weathering. It is unknown what caused some individuals to be of higher quality, but may have something to do with the actual field collection of the scat and not necessarily the laboratory extraction procedures.

3. **Amplification and sequencing of cytochrome b gene to confirm DNA is actually otter**
   We successfully amplified a subset of tissue (n=15) and scat (day 0: n=5, day 7, n=5) samples using universal cytochrome b primers. Some of these samples were cleaned and sent for sequencing to confirm that the DNA is indeed otter (see spreadsheet). Preliminary results from these few individuals suggests that DNA isolated from samples left to weather the full seven days is otter and not bacteria or dietary matter. We are in the process of optimizing reagent concentrations and thermocycling conditions to increase amplification success of future samples.

4. Amplification of microsatellite loci

Using primers from Beheler et al. (2004, 2005) we have attempted to amplify all tissue and scat samples for 14 individual otters at four microsatellite loci, with varied success. Although Beheler et al. found these loci to be polymorphic in their studies, we have not yet sent these samples to the DNA Core for analysis. Further experimentation will optimize amplification procedures and use other primers to examine additional loci.

5. Comparison of tissue and scat genotypes to ensure that scat yields reliable genotypes

We cannot address this until samples have been sent for analysis at the university.

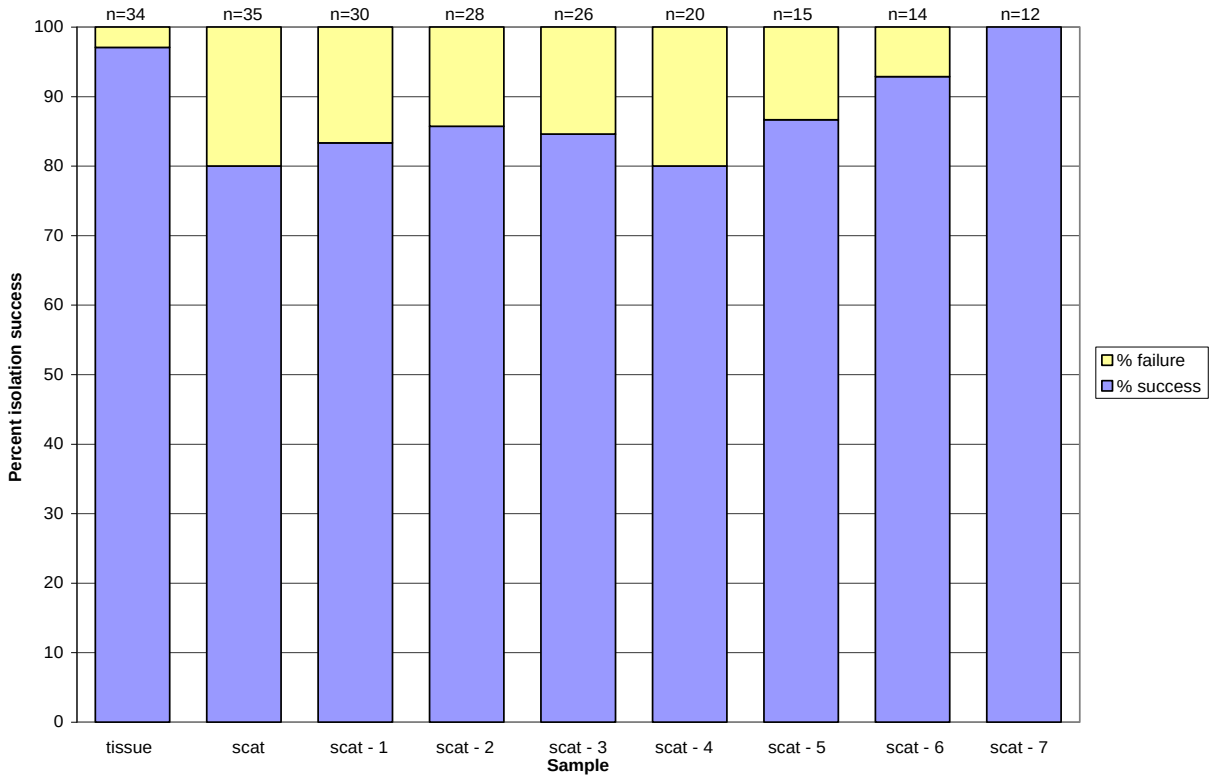


Figure 1. Success of isolating DNA from otter scat samples.

OTTER SCAT/GAMEFISH SURVEY

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Chuelo Arias, Resource Assistant, Missouri Department of Conservation

BACKGROUND

The impact of river otters on certain fish populations in Missouri has been a subject of much discussion and speculation. The impact on sport fish populations in the Missouri Ozarks, particularly populations of black bass and rock bass, is of great public concern to local anglers. River otter scat and latrine surveys began in the summer and early autumn of 2003 to assess the relative abundance and distribution of otters throughout the Ozark region. A total of ten waterways, selected due to high angling pressures and concern about otter predation, were sampled on two separate occasions as a pilot study in 2003. Scat densities were found to range from 4.6 per linear mile to 67 per linear mile in 2003. A marked decrease in scat and latrine densities was apparent on a few waterways for which previous data existed, possibly due to increased trapping pressure along these waterways. Associated sampling data from electro-fishing efforts suggest wide variation in populations of black bass and rock bass, with both high and low densities of fish previously found in areas with relatively high densities of otter scat. Also, variation in levels of otter activity among and within the sampled waterways seems to indicate that where declines in sport fish populations in the region have been documented, causes are likely due to a multitude of factors, including otter depredation.

A study of river otter food habits in Ozark streams indicate that otters do prey on sport fish populations at a higher rate than originally believed. However, river otter populations are beginning to decline in some streams due to focused otter harvest in targeted areas via otter trapping zones and encouragement.

The purpose of this study is to assess the relationship between estimated otter population sizes and associated counts of fresh otter scat deposits, and the possible use of latrine surveys as a cost-effective index to otter populations in Ozark streams.

PROGRESS TO DATE

Eight rivers (Roubidoux, Big Piney, West Piney, Current, Niangua, Osage Fork, Courtois, and Maries) were surveyed for otter scat as an index of abundance from January 17 – April 11, 2008. A crew of four otter survey technicians floated 13.9 mi. – 21.4 mi. segments of each river, marking all latrine sites. River mileages were obtained from either the *Paddler's Guide* or ArcMap calculations.

Once a latrine was found it was given a unique identification number, flagged, and its location entered into a GPS unit. All existing scats at the latrine were cleaned off the site. After a segment of river had been floated and the latrines marked, the crew returned after five days to count the scat that had accumulated at each latrine. To calculate an index of abundance, the number of scats counted along each river was divided by the length (in miles) of the surveyed segment to get the number of scats per mile.

A total of 492 scats were counted at 118 active latrines during the entire survey period. Approximately 66% of latrines that were found during the initial survey were considered active (had scat) at the time of the scat counts five days later. Of the eight rivers surveyed, the Osage Fork of the Gasconade River had the greatest index of otter abundance, with 5.6 scats/mile. The river with the lowest index of abundance was the Maries, with 0.9 scats/mile. Comparison to previous years was difficult due to surveying different segments of river and differences in index calculation. However, the average index values for 2003-2005 were generally greater than the 2008 index values (Figure 1).

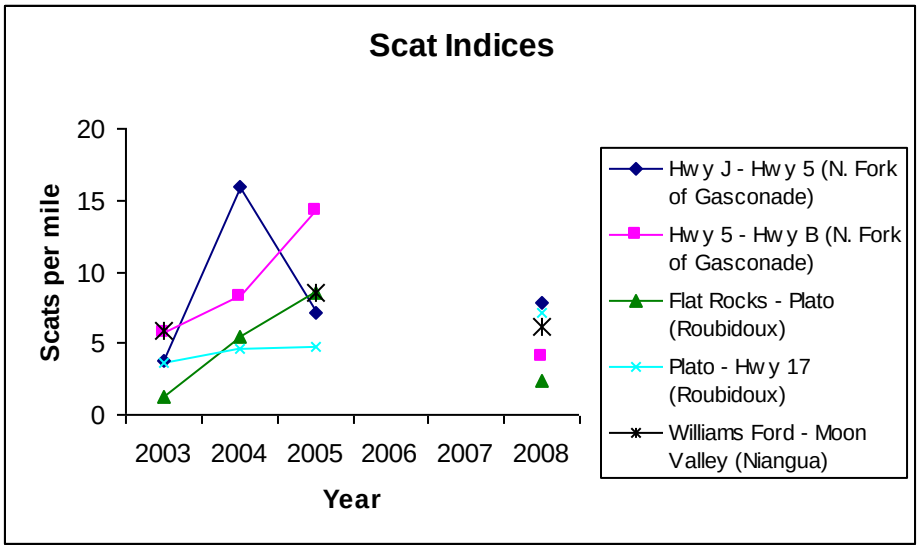


Figure 1. Number of otter scats located per mile of river.

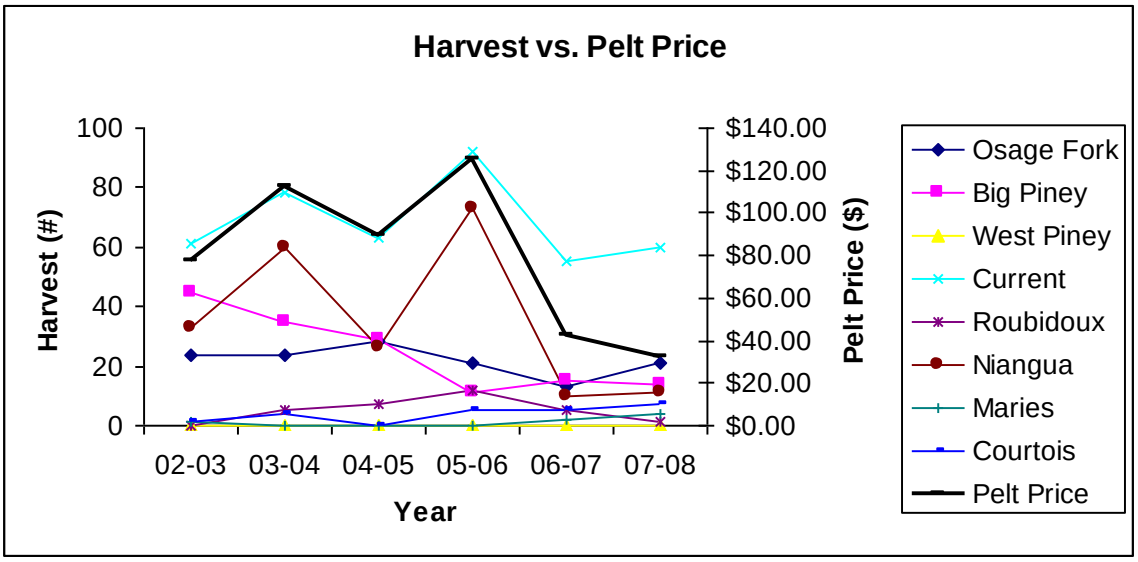


Figure 2. Missouri otter harvest by river compared to otter pelt prices.

Among rivers included in the study, otter harvest was highest in the Current and Niangua rivers (Figure 2). Yearly harvest in these two rivers closely mirrors otter pelt prices, which reached their peak during the 2005-06 trapping season.

Table 1. Scat indices from 2008 compared to 2003-2005.

	2008					
River/Segment	**Miles surveyed**	**Total # of scats**	**Scats/mile**	***2003 index***	***2004 index***	***2005 index***
Osage Fork of Gasconade	19.7	110	**5.6**			
Hwy J - Hwy 5	8.0	63	7.9	*3.7*	*16.0*	*7.2*
Hwy 5 - Hwy B	11.7	47	4.0	*5.7*	*8.3*	*14.2*
Big Piney	14.6	73	**5.0**			
Baptist Camp - Dogs Bluff	8.7	55	6.3			
Dogs Bluff - Mineral Spring	5.9	18	3.1			
Current River	17.0	67	**3.9**			
Akers - Lipps Hole	7.3	18	2.5			
Lipps Hole - Sinking Creek	9.7	49	5.1			
Roubidoux	21.4	110	**5.1**			
Flat Rocks - Plato (Hwy 32)	9.1	22	2.4	*1.3*	*5.5*	*8.5*
Plato - Hwy 17	12.3	88	7.2	*3.7*	*4.6*	*4.7*
Niangua	18.0	68	**3.8**			
Williams Ford - Moon Valley	10.1	63	6.2	*5.9*	--	*8.6*
Moon Valley - Bennett Spring	7.9	5	0.6			
West Piney	15.4	17	**1.1**			
Valleyview - Crawford	8.4	5	0.6			
Crawford - Big Piney	7.0	12	1.7			
Maries River	16.9	15	**0.9**			
Hwy P - Hwy T	8.5	7	0.8			
Hwy T - Westphalia (Hwy 63)	8.4	8	1.0			
Courtois	13.9	32	**2.3**			
Hwy C - Brazil Rd.	7.0	9	1.3			
Brazil Rd. - Berryman (Hwy 8)	6.9	23	3.3			

Table 2. Otter population indices by river based on otter harvest.

		2000-2001		2001-2002		2002-2003		2003-2004		2004-2005	
River / County	**Miles of river**	**No. of otters harvested**	**Otters per mile of river**	**No. of otters harvested**	**Otters per mile of river**	**No. of otters harvested**	**Otters per mile of river**	**No. of otters harvested**	**Otters per mile of river**	**No. of otters harvested**	**Otters per mile of river**
Big Piney River	**155.2**	**37**	**0.24**	**27**	**0.17**	**45**	**0.29**	**32**	**0.21**	**29**	**0.19**
Pulaski	79.7	3	0.04	11	0.14	2	0.03	12	0.15	11	0.14
Texas	75.5	34	0.45	16	0.21	43	0.57	20	0.27	18	0.24
Bryant Creek	**64.4**	**21**	**0.33**	**32**	**0.50**	**35**	**0.54**	**31**	**0.48**	**30**	**0.47**
Douglas	35.1	9	0.26	20	0.57	20	0.57	5	0.14	3	0.09
Ozark	25.1	11	0.44	12	0.48	14	0.56	26	1.03	27	1.07
Webster	0.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Wright	3.60	1	0.28	0	0.00	1	0.28	0	0.00	0	0.00
Current River	**158.2**	**65**	**0.41**	**62**	**0.39**	**61**	**0.39**	**78**	**0.49**	**63**	**0.40**
Carter	30.2	21	0.70	25	0.83	24	0.80	26	0.86	17	0.56
Dent	23.5	9	0.38	3	0.13	13	0.55	5	0.21	2	0.09
Ripley	32.7	16	0.49	26	0.80	7	0.21	8	0.25	10	0.31
Shannon	67.5	9	0.28	8	0.12	17	0.25	39	0.58	34	0.50
Texas	4.4	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Eleven Point River	**95.4**	**21**	**0.22**	**29**	**0.30**	**13**	**0.14**	**51**	**0.54**	**49**	**0.51**
Howell	33.3	0	0.00	0	0.00	0	0.00	0	0.00	1	0.03
Oregon	62.1	21	0.34	29	0.47	13	0.21	51	0.82	48	0.77
Jack's Fork	**65.1**	**17**	**0.26**	**4**	**0.06**	**26**	**0.40**	**30**	**0.46**	**24**	**0.37**
Howell	4.3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Shannon	37.9	11	0.29	0	0.00	6	0.16	7	0.19	20	0.53
Texas	22.9	6	0.26	4	0.18	20	0.88	23	1.01	4	0.18
North Fork White	**62.7**	**34**	**0.54**	**35**	**0.56**	**25**	**0.40**	**27**	**0.43**	**19**	**0.30**
Douglas	34.7	16	0.46	2	0.06	5	0.14	8	0.23	7	0.20
Ozark	21.7	18	0.83	33	1.52	20	0.92	19	0.88	12	0.55
Texas	6.3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Osage Fork	**78.7**	**14**	**0.18**	**23**	**0.29**	**24**	**0.31**	**18**	**0.23**	**28**	**0.36**
Laclede	56.8	6	0.11	14	0.25	11	0.19	15	0.26	28	0.49
Webster	21.9	8	0.37	9	0.41	13	0.59	3	0.14	0	0.00
Niangua River	**129.4**	**19**	**0.15**	**44**	**0.34**	**32**	**0.25**	**60**	**0.46**	**26**	**0.20**
Camden	22.9	1	0.04	5	0.22	3	0.13	3	0.13	0	0.00
Dallas	71.4	2	0.03	17	0.24	16	0.22	32	0.45	15	0.21
Laclede	20.1	16	0.80	17	0.85	12	0.60	11	0.55	4	0.20
Webster	15.0	0	0.00	5	0.33	1	0.07	14	0.94	7	0.47

		2005-2006		2006-2007							
River / County	Miles of river	No. of otters harvested	Otters per mile of river	No. of otters harvested	Otters per mile of river	No. of otters harvested	Otters per mile of river	No. of otters harvested	Otters per mile of river	No. of otters harvested	Otters per mile of river
Big Piney River	**155.2**	**11**	**0.07**	**15**	**0.10**						
Pulaski	79.7	3	0.04	8	0.10						
Texas	75.5	8	0.11	7	0.09						
Bryant Creek	**64.4**	**8**	**0.12**	**13**	**0.20**						
Douglas	35.1	6	0.17	8	0.23						
Ozark	25.1	2	0.08	5	0.20						
Webster	0.50	0	0.00	0	0.00						
Wright	3.60	0	0.00	0	0.00						
Current River	**158.2**	**92**	**0.58**	**55**	**0.35**						
Carter	30.2	57	1.89	23	0.76						
Dent	23.5	13	0.55	0	0.00						
Ripley	32.7	10	0.31	12	0.37						
Shannon	67.5	11	0.16	20	0.30						
Texas	4.4	1	0.23	0	0.00						
Eleven Point River	**95.4**	**52**	**0.55**	**31**	**0.32**						
Howell	33.3	1	0.03	0	0.00						
Oregon	62.1	51	0.82	31	0.50						
Jack's Fork	**65.1**	**31**	**0.48**	**27**	**0.41**						
Howell	4.3	1	0.23	0	0.00						
Shannon	37.9	17	0.45	10	0.26						
Texas	22.9	13	0.57	17	0.74						
North Fork White	**62.7**	**26**	**0.41**	**37**	**0.59**						
Douglas	34.7	5	0.14	4	0.12						
Ozark	21.7	21	0.97	31	1.43						
Texas	6.3	0	0.00	2	0.32						
Osage Fork	**78.7**	**21**	**0.27**	**13**	**0.17**						
Laclede	56.8	17	0.30	11	0.19						
Webster	21.9	4	0.18	2	0.09						
Niangua River	**129.4**	**73**	**0.56**	**10**	**0.08**						
Camden	22.9	1	0.04	0	0.00						
Dallas	71.4	55	0.77	6	0.08						
Laclede	20.1	5	0.25	1	0.05						
Webster	15.0	12	0.80	3	0.20						

REDUCING OTTER USE OF SMALL PONDS

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Chuelo Arias, Resource Assistant, Missouri Department of Conservation

BACKGROUND

Objectives of Otter Use of Farm Ponds and Small Impoundments in Missouri:

1. Describe the extent and nature of otter depredations on fish in ponds and small impoundments in Missouri.
2. Describe the biological and physiographic features of ponds and small impoundments in Missouri that have been depredated by otters and determine which variables are highly associated with otter depredation. This can be done in a variety of methods.
3. Assess methods for pond and lake owners to use to reduce otter depredations on fish.

The otter enclosure at the Green Area has served as a research site for this project. Otters have been kept and observed in the pen at various times over the past two years. Scat counts of the captive otters conducted from January to June 2007 showed that each otter excreted approximately 5.5 scats per day. It was also noted that the pond had to be restocked every 3-4 weeks with 150-300 catfish. This is an indicator of the extent of depredation that can occur in small ponds.

During this time, various trap designs were introduced to test their effectiveness at capturing otters. Most traps consisted of coated 1x1 in. wire cages which were attached to a dock on the northern bank. The frames of the cages were built with sealed PVC and floated well. A submerged entry method using a funnel design (similar to a minnow trap) proved ineffective, as the otters were simply too powerful and nimble to be held by the close-behind wiring on the end of the funnel. One-way, spring loaded, submerged entry doors became the focus of much of the design work, as 3 different types were tried: Plexiglas doors, heavy wire doors (cage material), and iron welded doors with vertical bars. Another trap design that was tested was basically a floating platform (5X5 ft.) with a Plexiglas one-way entry in the center going down into the cage. The most successful traps were the Plexiglas and iron welded one-way submerged door designs. However, none of the designs met expectations and it was recommended that more traps need to be tested.

To determine how the otters would interact with the traps, a TrophyCam system was used to provide VHS video footage of otter activity (motion detection, night vision). Most otter activity around the trap prototypes occurred at night. Several incidents were recorded which involved otters entering the traps and escaping through seams, doors, etc.

PROGRESS TO DATE

Based on the information gathered last year, we expanded our research efforts at the otter enclosure. In February 2008, Resource Science began working with Matthew Dekar, a graduate student from the University of Arkansas. His doctoral project is studying the seasonal metabolic expenditures of river otter. Metabolic rates from free-living otters have not been calculated preventing accurate estimation of consumption in wild otters. Therefore, assisting with this project gave us the opportunity to learn more about the possible extent of otter depredation in small ponds.

For this study we trapped three otters, one from Eagle Bluffs Conservation Area and two from a private pond west of Columbia. Upon capture the otters were taken to a veterinarian, where they were injected with doubly-labeled water and background and initial blood samples were drawn. The otters were then released in the Green Area otter enclosure before being re-trapped three days later. Upon recapture, the otters were taken back to the veterinarian, where final blood samples were drawn. All of the blood

samples were taken back to Arkansas for analysis of CO_2 production and energy metabolism. This was then translated into biomass consumption rates. Analysis showed that the largest male otter that was held in the enclosure consumed approximately 5.5 lb of biomass per day. To date, this is the only consumption rate that has been estimated. However, once the analysis is complete, a consumption model can be developed that will allow researchers and managers to estimate the amount of each prey type consumed throughout the year. In addition, consumption estimates will give insight into the ecological constraints regulating otter populations. Finally, data from these studies will highlight important interactions and impacts of otters on prey populations, including sport fishes.

The other aspect of research that was performed this year was the testing of another trap design. The new trap was a floating, top-entry design. The trap was placed in the pond at the Green Area otter enclosure (un-baited) as well as at Blind Pony Lake (baited). Trail cameras were used to monitor how otters interacted with the trap at both locations. However, based on the photographic evidence, it appears that no otters approached the trap. We are unsure why the otters did not inspect the trap. It is possible that the otters at these locations had seen traps before and therefore avoided it, or that the otters were not using the areas where we placed the trap. Further testing will continue with this trap design at different locations.

LARGE CAPTIVE CARNIVORE MARKING PROGRAM

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Chuelo Arias, Resource Assistant, Missouri Department of Conservation

BACKGROUND

Dangerous captive animals have recently come under public scrutiny. Because of the inherent danger and potential liability associated with the possession of large carnivores, an effective system was needed to verify ownership and better monitor the legitimate purchase, sale and trade of these animals. The Department of Agriculture is currently evaluating regulations for the possession of dangerous carnivores other than those regulated by MDC. The MDC wants to take a proactive approach in response to the public demand for more accountability and to provide some consistency between us and the Department of Agriculture. The intent of these new provisions is to better enable our enforcement and record keeping obligations, safeguard permit holders from false claims of ownership, and satisfy public demand for higher accountability of these potentially dangerous animals. In addition, our Department would have the ability to distinguish captive animals from truly wild animals.

Based on these issues, MDC recently made significant regulation changes pertaining to large carnivores owned under the Class II Wildlife Breeder Permit. The proposal to permanently mark all captive bears, mountain lions, wolves, and wolf hybrids was approved by the Regulations Committee and Conservation Commission in 2007. The regulation will appear in the 2008 code book under code: 3 CSR 10-9.353 Privileges of Class I and Class II Wildlife Breeders, and has a 1 July 2008 compliance date. Effective July 1, 2008, all mountain lions, black bears, wolves and wolf-hybrids held under the privileges of a Class II Wildlife Breeder Permit are required to be uniquely identified with a permanent Passive Integrated Transponder (PIT) microchip. These microchips are about the size of a grain of rice and contain an electromagnetic code that can be used to identify animals. They can be injected under the skin to permanently mark animals without altering external appearance. Microchips are normally placed just under the skin along the back of the animal, between the shoulder blades. This standardized protocol allows animals to be searched quickly and efficiently. The regulation also requires owners to allow the Department to obtain, from each animal, a small blood or tissue sample sufficient for DNA analysis.

PROGRESS TO DATE

Surveys and interviews were completed with 33 of the 50 captive carnivore owners in the state. Feedback from the interviews showed that a majority of owners are generally supportive of the new regulations, but have concerns about the welfare of their animals. An informational workshop was held in Jefferson City on February 9, 2008. The workshop provided a forum for MDC personnel, veterinarians, and captive carnivore owners to discuss the procedures for marking captive animals. The contract with Wildlife Genetics International for DNA testing was finalized in May 2008. DNA samples will be stored at Resource Science in Columbia until all samples have been collected and then will be sent to Wildlife Genetics International for analysis. As of June 1, Department personnel have assisted in implanting microchips in and collecting DNA samples from 23 different animals at eight facilities around the state. Tagging sessions will continue throughout the summer until all permitted bears, mountain lions, wolves, and wolf hybrids have been marked.

BLACK BEAR MANAGEMENT PLAN UPDATE

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Liz Forbes, Resource Assistant, Missouri Department of Conservation

UPDATE

The bear management plan is nearly complete. We are considering the implementation of population estimate techniques. We recently outlined the major goals we intend to accomplish over the next several years.

Black bear program goals

1. Increase knowledge about current black bear population status in Missouri.
2. Increase knowledge of black bear ecology in Missouri, how they move, disperse and travel on a landscape level and identify source and sink populations.
3. Develop black bear conservation and management strategies based on information gathered through research, monitoring, and surveys.
4. Educate Missouri's public, the media, and other resource professionals in Missouri and the Midwest about black bears and Missouri's black bear management program.

BEAR SIGHTINGS IN MISSOURI

Printed black bear observation forms are available to most MDC field staff. Recently, an electronic form was developed to save time and printing and postage costs. The form has been sent to field staff and will eventually be placed on the MDC public website.

The greatest number of bear reports has come from Ozark County (Figure 1). In general, the counties around Ozark County up through Franklin County have the greatest reported bear activity. These reports include bear sightings and the observation of bear sign such as scat and tracks.

The number of cubs observed, if any, is also recorded on the observation forms. The most cub reports have arrived from Reynolds, Howell and Taney counties with 13, 12 and 10 cubs, respectively (Figure 2).

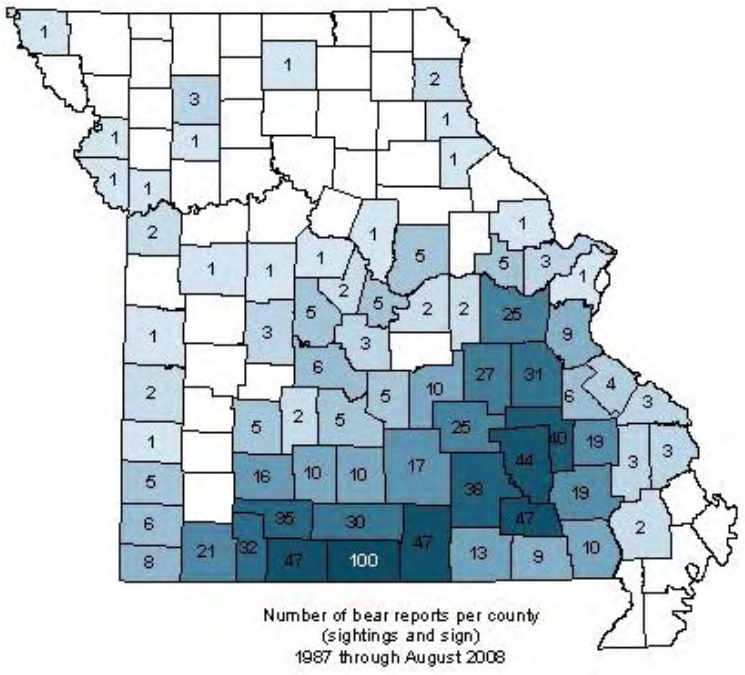


Figure 1. Distribution of black bear reports across Missouri by county, 1987 to Present. Black bear reports included sightings of bears and bear sign such as scat.

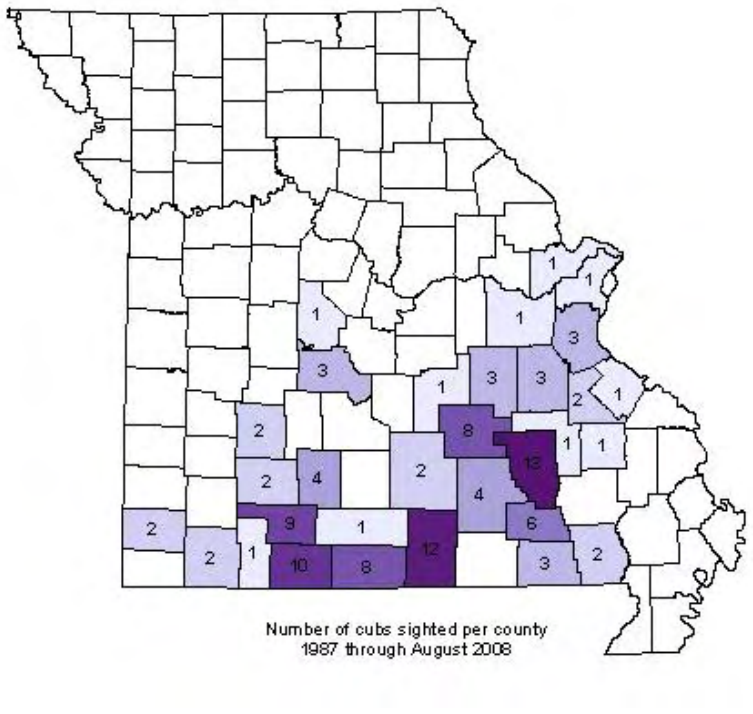


Figure 2. Number of black bear cubs observed in Missouri by county, 1987 to Present.

ILLEGAL METHOMYL BAITS FOR CONTROL OF RACCOONS

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
Mike McKee, Resource Scientist, Missouri Department of Conservation

BACKGROUND

Methomyl is a carbamate insecticide used in Golden Malrin fly bait (granular formulation) and has very high acute toxicity to mammals and birds. In 2007, the Wisconsin Department of Natural Resources issued a press release related to the illegal use of Golden Malrin fly control bait mixed with coke or other soft drink for the purpose of killing raccoons and other vertebrate pests. A one-pound can of Golden Marin contains enough material to kill about 18 raccoons assuming an LD50 of 50 mg/kg and 1% active ingredient.

PROBLEM

In early 2008, the Resource Science Center (Jeff Beringer) was contacted by Conservation Agents and Damage Control Biologists indicating that the illegal use of Golden Malrin to control raccoons is becoming a significant problem in Missouri. Subsequent to this, MDC received a letter from Dale Loveland (Missouri Citizen) requesting a response as to their proposed action plan to reduce the illegal use of Golden Malrin.

ACTIONS TO BE TAKEN

- Met with the Missouri Department of Agriculture (MDA) to apprize them of the Golden Malrin issue and potential solutions.
- Drafted a paragraph to describe the interaction between MDC and MDA when a misuse has been identified.
- MDC met with Mr. Loveland to discuss response to his letter (Matt Wolken, NE Regional Office, will coordinate).
- Contacted national and regional EPA offices to determine degree of awareness of this issue.
- Compiled available MDC information to support need for action relative to Golden Malrin misuse.
- Prepared memo/letter noting results of phone survey of several local pesticide supply stores.
- Prepared memo/letter summarizing results of the meeting for multi-state wildlife professionals' resolution on this issue (Jeff).
- Prepared memo/letter summarizing suspected Golden Malrin illegal uses (wildlife poisonings) in the past year.
- Circulated information via e-mail and determine if another meeting is necessary.

TRAPPING MATTERS WORKSHOP

Jeff Beringer, Resource Scientist, Missouri Department of Conservation
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SUMMARY

Trapping is a sensitive and controversial issue in Missouri and even more so in other states. The public looks to wildlife agencies, such as MDC, to study and recommend the most humane and efficient trapping methods and to sort dogma from facts. Serving as *the* source for trapping knowledge and information seems like an overwhelming responsibility, especially for those with limited or no trapping experience. Wouldn't it be nice to have a training session to educate and update resource professionals about modern-day trapping? Fortunately there is and 35 employees had the opportunity to attend the Trapping Matters Workshop held in Jefferson City on May 12, 2008. Participants included office staff, technicians, agents and biologists. The workshop, a joint effort between MDC and the Association of Fish and Wildlife agencies, was organized by Bryant White and Jeff Beringer. The workshop focused on the basics of trapping in Missouri and how to handle trapping related questions from reporters and the public. Here is a breakdown of the speakers and topics:

Samara Trusso, Wildlife Management Supervisor from Pennsylvania Fish & Game, discussed the benefits of regulated trapping as a wildlife management, conservation, and research tool. These benefits include: population control, biological study, relocation of animals for restoration, and reduction of crop damage. Samara also discussed how best to convey the benefits of trapping to the public.

Dennis Stauffer, from a private media and communications consulting group, trained participants on how to answer difficult questions and tips for communicating with the media and the public. He also presented survey data that showed where public sentiment lies and how best to approach sensitive issues. He stressed the following 5 key messages that should be expressed when discussing trapping with the public: 1) that trapping is a highly regulated activity, 2) the species of wildlife trapped are abundant, 3) trapping is selective towards certain wildlife species and is managed through science-based regulations, 4) state wildlife agencies review and develop regulations to ensure that trapping is humane, 5) and that regulated trapping provides many benefits to wildlife and people. Dennis explained that we, as an agency, must emphasize the benefits of trapping that the public already finds most acceptable in order to gain their support.

Daryl Damron, MDC Wildlife Damage biologist, explained the development of trapping best management practices (BMPs) and demonstrated all of the different types of traps used in Missouri. The development of trapping BMPs included extensive scientific studies to identify the most humane and efficient capture devices and techniques for furbearers. These traps include foot-hold traps, body-gripping traps, cable restraints, cage traps and specialty devices. **Jim Braithwait**, MDC Wildlife Damage Biologist, then gave a demonstration of how different types of traps are used in the field.

The workshop was an excellent overview of trapping regulations in Missouri and how to effectively communicate our message about how and why trapping is used as a management tool. In general, the public doesn't know much about trapping and looks to us for the answers. Now, thanks to the workshop, 35 more resource professionals are more prepared to answer those questions professionally and competently.